POPULAR MECHANICS

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"Tells you how to do things" — Written so you can understand it

Smithsonian Institution

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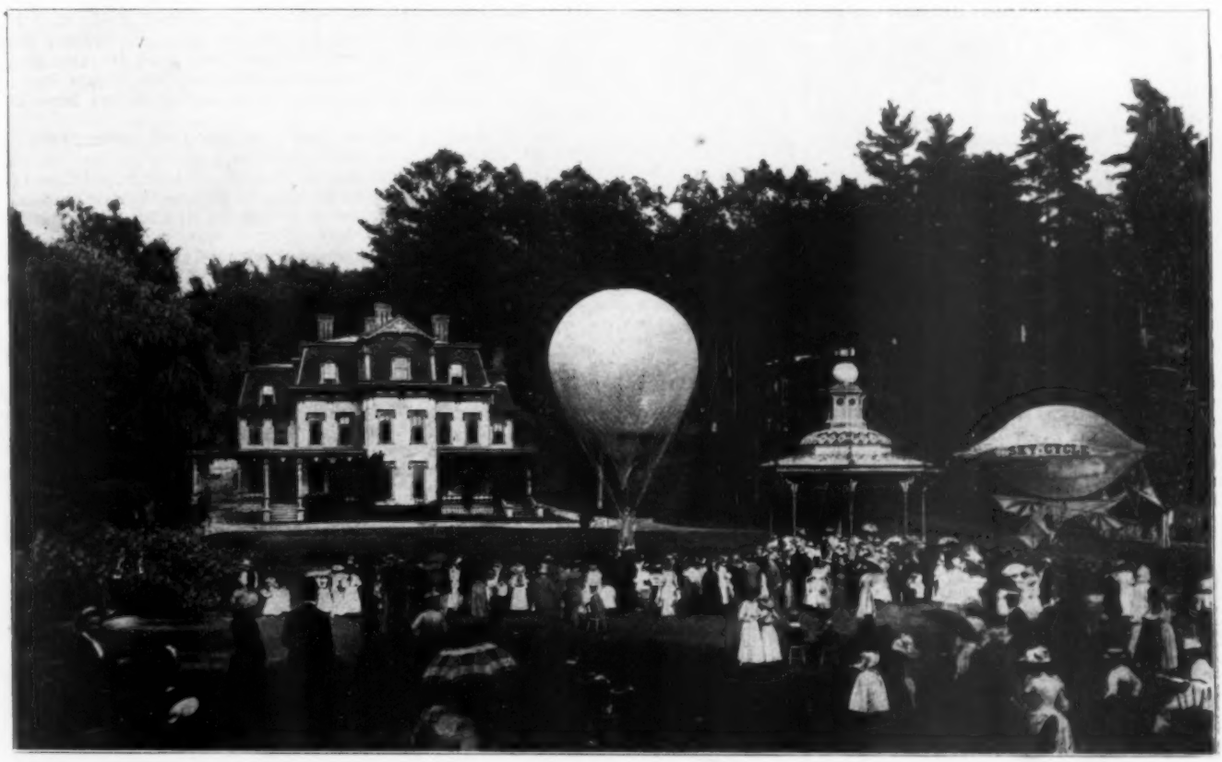
Aerial Picnic on Myers' Balloon Farm



Novel Social Event Where Riding in Balloons and Airships is as Common as Traveling in Electric Cars at a Trolley Party

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Oil Burning Steamers Befoul Harbors.
Largest Dipper in the World.
Device for Converting Alternating into Direct Current.

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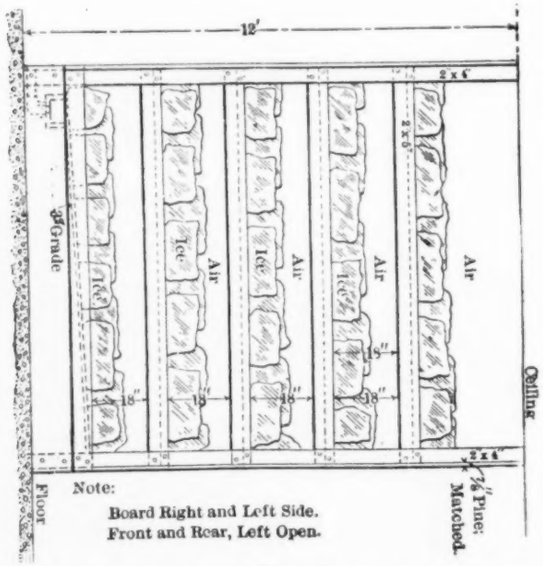
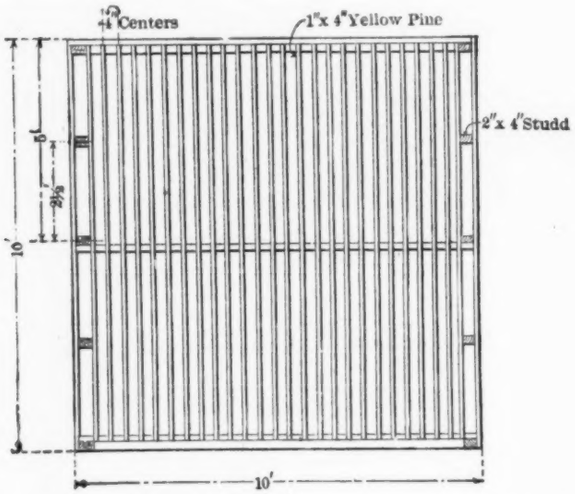
COOLING AN ASSEMBLY ROOM WITH ICE.

No matter how hot the weather may be, or how many people are crowded into a room, it is possible to maintain a delightfuly cool temperature by cooling the air which ventilates the auditorium. In an address before the American Society of Heating and Ventilating Engineers, J. J. Harris related how he cooled the High school at Scranton, Pa., last summer. The Metal Worker in reporting the lectures quotes Mr. Harris as follows:



The Scranton High school were to hold graduation exercises in a room intended to hold 900 people, but which would have to contain 1,400. As the weather was almost unbearable the directors desired to cool the room and gave me two days in which to do it.

A rack was constructed in the fresh air inlet large enough to hold about 8 tons of ice, with several shelves having slatted bottoms, the frame being made from 2x6 inch hem-



lock studs. At 6 o'clock in the evening the ice was placed in the rack and staggered in such a way that the air was compelled to pass around and between the cakes of ice until discharged by the fan through the flues into the auditorium above, to mingle with the sultry atmosphere, tempering, diffusing and maintaining a temperature that was most invigorating. The bottom or floor of the rack was made from matched pine lumber and lined with No. 28 galvanized iron, and drained by a 2-inch gas pipe. Two fans of the disk type are employed to ventilate this building, one 11 feet diameter, and an 8-foot diameter exhaust fan, located in the attic, the air being forced into the auditorium through a vertical flue at each side of the stage and from above the dressing rooms, foul air making its exit through the registers in the floor, and which are located in the aisles. The construction of this system admits of by-passing all the air intended for the building through the auditorium.

The outside temperature was 90 degrees F., while the inside temperature was maintained at 76 degrees F. The humidity was normal, and at no time reached a point of saturation. That it proved satisfactory can best be demonstrated by the fact that the directors were so well pleased that they desired the method to be used for the coming exercises, June, 1903.

The size of the auditorium is 80 feet by 80 feet by 20 feet high. The amount of ice melted was, on June 11, 13,600 pounds; June 12, 11,800 pounds; June 13, 13,000 pounds, making a total of 38,400 pounds melted during the three nights.

HOW LAKES ARE TURNED TO LAND.

Process of Change That is Continually Going on in America

This continent abounds in rich agricultural fields that but a few years ago were broad expanses of limpid water. How these lakes have been transformed into land is interesting. Rivers running into lakes are quite dark, but those leading away are clear, showing that much sediment has been left behind.

The Mississippi carries yearly to the Gulf over 13,000,000 tons of matter. It would take but a day's portion of this burden to convert any one of the many ordinary lakes into broad meadow lands. Some idea of the rapidity with which lakes die under this process is shown in the fact that seventy-three out of one hundred and forty-nine lakes in the Swiss region have disappeared since 1873. Lakes die by either being filled up or drained off. The draining off results when a river has worn a gorge back so deep that the water all runs out.

The Niagara River is doing its best in this draining by cutting as fine a trench as could be made by an engineer. It is cutting back toward Lake Erie at the rate of over four feet a year, and in time will kill the lake. Unfortunately, however, the lake is destined to be drained through Chicago. Lake Tahoe, a beautiful lake in the Sierra Nevada Mountains, is also one of those destined in time to be killed as a result of the draining process. Peat is one of the greatest fillers and works more rapidly than any other form of deposit. It is estimated that one-tenth of Ireland is peat and over one-fourth of the State of Indiana was once a peat bog.

The Dismal Swamp in Florida was once a vast lake, but is now a great area of bogs and swamp, with only a little lake in one part. So rank is the growth of this peat in that hot land that the surface of the lake is fourteen feet higher than the level of the surrounding bogs, showing that it has been literally forced up into the air.

Lakes, swamps, bogs and then garden lands represent the stages in the process of dying. Filling, draining and encroachment of vegetation represent the process that kills the lakes in warm climes, while the forces of the air are agencies in the cooler portions of the world.

BAKE A HALF TON OF BREAD IN FOUR HOURS.

The new process of bread-making saves the world a great amount of time and expense. The various materials are poured into a huge glazed tub shaped rather like a cover of paddle wheel. The tub rocks to and fro and the paddle revolves inside mixing the dough more thoroughly than human hands could do and of course far more cleanly. In a few minutes ¼ of a ton of dough is ready on the huge tub divided accurately into quartern and semi-quartern weights. It is next shaped and passed into a gas heated oven automatically set at the correct temperature. In three hours and 54 minutes one-half a ton of bread is ready for the consumer. The same amount requires 54 hours of hard work by the old-fashioned method.

Popular Mechanics prints the best of the best things published.

A shipment of cotton to Germany, which has just been made from German East Africa, is exciting much interest in that it opens up wide possibilities for the future cotton import trade of Germany.

Egypt has to-day 5,000,000 acres of agricultural land and half of this lies in the delta.

Grandest Spectacle of the Age Was the Durbar at Delhi

Men and Beasts Were Bedecked With Purest Gold and Silver--And the Queen of All the Splendor who was Borne Through the Streets of Delhi on Asia's Finest Elephant was a Former Chicago Girl

With pomp and splendor the modern world had never witnessed before, the great Durbar at Delhi was celebrated by the proudest chiefs of India and the flower of royalty of the British empire. The leading actors in this resplendent show were Lord Curzon, Viceroy of India, and his wife Lady Curzon, vicerine of India and a former Chicago girl—Miss Mary Leiter. Lord Curzon as the highest officer of India was the representative of King Edward in the grand celebration that was to proclaim his majesty King and Emperor. The Viceroy and Lady Curzon, mounted on the pride elephant of India, occupied the position of honor in the magnificent procession of 150 elephants which was one of the most gorgeous scenes of the celebration.

The Graphic of London says: "The finest elephants of Asia were seen in the imposing procession as it passed through the ancient seat of the Mogul. The Viceroy and Lady Curzon were carried by an enormous tusker, which was almost hidden by its golden saddlecloth. The splendor of the native princes and their elephants was superb. Gold and silver and bright colors made them a wonderful spectacle. The first elephants with their silver howdahs carried staff officers. Then came the Viceroy and Lady Curzon seated in the grand howdah decked with gold and silver."

Speaking of the grand climax—wherein Edward was proclaimed King-Emperor, the Graphic says:

"When the viceroy had mounted the dais, the massed bands played the national anthem and then a salute of 31 guns was fired. Drums rolled and the bands poured forth a triumphant peal of music. In answer to his summons the silver trumpets

Lord Curzon, Viceroy of India, and His Chicago Wife, Now Vicerine of India, Starting to Make Their State Entry Into the City of Delhi.

of the herald's trumpeters rang out and at the entrance to the arena facing the dais the herald, Major Maxwell of the 6th Prince of Wales' Bengal cavalry, stood forth in his gorgeous tabard of gold and many colors on a black charger. Behind him, also an black steeds, were his drummer and twelve trumpeters—six British and six native. They halted for a moment, sounded another flourish, and breaking up into two parties the herald with six trumpeters on one side and the drummer with six on the other side advanced up the arena toward the dais. At its foot both parties formed up again together. They halted and sounded a third flourish. The herald saluted and receiving the Viceroy's command read the proclamation. Then the royal standard of the King-Emperor was unfurled from the lofty flagstaff in the center of the arena and the massed bands rolled out the national anthem."

The Illustrated London News says: The occasion was of a magnificence, the like of which even India, that land of pageantry, had never beheld. His excellency Lord Curzon was accompanied in his progress by the duke and duchess of Connaught and the royal and viceregal party entered the city escorted by the Viceroy's bodyguard and the imperial Cadet

Lord Curzon, Viceroy of India, King Edward's Representative at the Imperial Durbar.

Corps which included many young Maharajahs in magnificent uniforms. The great dignitaries rode on elephants caparisoned with the utmost oriental splendor. They were followed by ruling chiefs of India similarly mounted and the appearance of this part of the procession, which included 150 huge elephants, was of barbaric grandeur. The pageant passed through Delhi by way of the famous thoroughfare, the Chandni Chauk, which was gaily decorated for the occasion. At frequent intervals loyal mottoes were displayed, and the roadways were lined with crowds of sightseers. The cortege left the city by the Mori gate and in the plain outside, the Duke and the Viceroy took leave of each other and proceeded to their camps delighted with the success of the spectacle.

SEND TELEGRAMS BY TRAIN.

Storm Breaks Wires and a Thousand Messages Are Carried From Chicago to St. Louis by Special Messenger.

The heavy snow and sleet storms of February caused great damage to telegraph and telephone companies in Chicago and the middle west and hindered the operation of electric railway lines. Practically all direct telegraphic communication was cut off from Chicago to New York and any messages transmitted for a time had to be sent by very roundabout routes. One message sent from Chicago to New York went via San Francisco, Winnipeg and Montreal. The message was sent and an answer was received by this long route in just 20 minutes. At the close of the second day of the storm about a thousand messages for St. Louis had accumulated in the Chicago office which could not be sent on, so a special messenger was sent by railroad to St. Louis to deliver them.

Do not trim a large cork to make it fit into a small bottle. Just let it soak in boiling water for five minutes and it will fit into the bottle neck without further trouble.

CHIEF AND FIREMEN DIE FROM GASES.

Return from a Struggle to Begin a Struggle With a Foe More Deadly Than Fires They Have Fought

The death of Chief James Foley, of the Milwaukee fire department, with three of his bravest men and the serious injury of nearly a score of others from the effects of inhaling nitric acid gas has created a profound impression among fire fighters all over the world. Not before was it realized that the noxious fumes of nitric acid gas were so fatal. While the lesson has been an irretrievable loss to Milwaukee it may serve to the world's advantage in bringing about a safer method of fighting gases than is now employed.

There was no fire; only a carboy of the nitric acid had broken at the plant of the Schwaab Stamp & Steel Company, and the gases rose like smoke in sickening, hurtful fumes, which the brave firemen did not hesitate to attack in the discharge of their duty. All about were men, who knew the danger of the acid gases and who were accustomed to handling them; but why should they risk their lives when the city of Milwaukee employed men whose duty it was to die in defense of a corporation's property when necessary?

So the firemen did their work unhesitatingly as all the while they unconsciously breathed the air of poison. The escaping gases were cleared away and the cause removed in twenty minutes. Then the firemen went home, none realizing that the deadly fumes they had inhaled were yet to clog up the blood of their bodies and exhaust their breath. Soon a ghastly sickness pervaded them and the firemen began their struggle with death. The gases they had breathed were fires that now tugged at the very portals of their lives. They knew better how to save the lives and property of others than to fight the devouring influences of these gases that raged and gnawed within them. It was an awful struggle as the men lay on their cots at fire headquarters, none knowing who would next surrender to the most deadly lurking foe they had ever yet encountered. Before daylight the next morning came the news to the firemen who lay yet battling with death that their beloved chief for 20 years had succumbed. Captain Andrew White of the hook and ladder truck company could not longer withstand the gaseous foe, and died. Edward J. Hogan and Thomas A. Droney, chemical pipemen, now surrendered to the arms of Death which they had withstood before a hundred times. By the most arduous labors of the medical talent of Milwaukee, further fatalities were prevented, but it looked for a time as if the flower of the Milwaukee department was at once to be wiped from existence by the influence of these insalubrious gases. Of the hook and ladder truck company there was not a man who was not poisoned by the fumes.

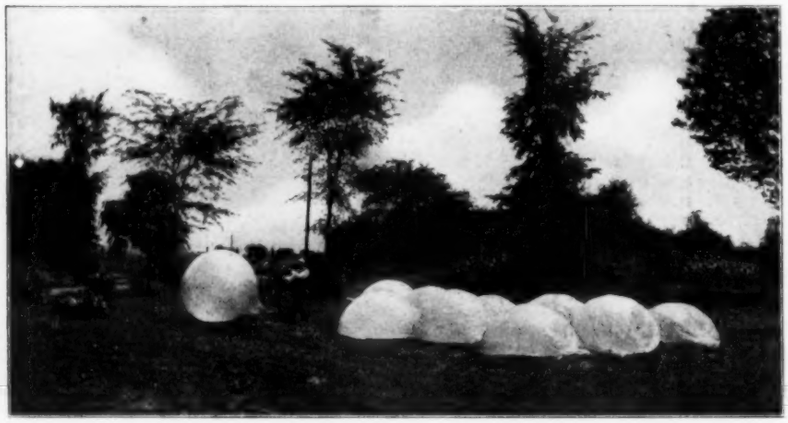
If the firemen had inhaled ammonia after feeling the first ill effects probably none of them would have died, as ammonia is said to be the best antidote for such poisons. They also made a mistake in spreading sawdust over the spilled acid. The best way of effecting its neutralization would have been to cover it with the dry chemical fire extinguisher.

The water buffalo is the most useful and profitable of the animals employed by the Egyptians.

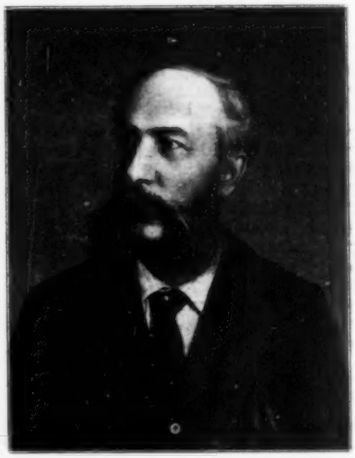
BALLOON FARM WHERE AERIAL WAR VESSELS COME FROM.

Carl E. Meyers Quietly Accomplishes for Uncle Sam That for Which Foreign Inventors Strive in Vain

While scientists are discussing the problem of airships in Europe, and debating as to whether the navigation of the air will ever be an accomplished fact, there is a man in the United States who is quietly building airships in wholesale lots and sailing them about as he desires for his profit and amusement. Foreign nations have often wondered where the great balloons employed by the United States during the Spanish-American war came from. They were made by this same man who is now engaged in building a fleet of balloons and airships. This man is Carl Myers and in the secluded little town of Frankfort, N. Y., he has a balloon farm where nearly every kind of vehicle for navigating the air is produced. Often friends of the professor come down from Utica, nine miles away and have an aerial picnic and then riding in the air is as common as trolley rides in the city.



Group of United States Signal Balloons at the Balloon Farm

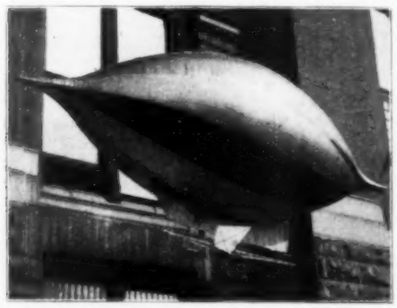


Carl E. Meyers, Owner of the Balloon Farm at Frankfort, New York

The balloon farm is an unique institution, devoted to producing hydrogen gas balloons, airships and other aerial creations. Within a brief period it has produced for the United States government, 108 hydrogen gas balloons, 21 during our late war with Spain, and 11 during the season of 1902 for use in the army and navy manoeuvres off the Atlantic coast last September, previous to which a detachment of the United States Signal service balloon corps under Major Rebur and Lieut. Clifton from the Signal Post at Fort Myer, Va., near Washington, D. C., visited the balloon farm to inspect balloons under construction and become adept in their operation.

The latest in the airship line to be seen in the balloon farm is the electrical aerial torpedo, which is a complete working model of a dynamite air crusier, intended especially for exhibition purposes as an object lesson demonstrating to the public the ease with which real air navigation is achieved. The torpedo herewith shown is 13 feet long and consists of a plump, sharp pointed gas spindle supporting two rails like the gunwales of a boat, midway of which is an extremely powerful motor of 4½ lbs. weight. This revolves a 30-inch diameter propeller having two 4-inch wide blades of aluminum. At the bow of the vessel shines an electrical beacon light, in rear of which is an electrical rheostat on one gunwale, and upon the other side a small anemometer marks the speed of flight per minute. In the rear of this are two outspread aeroplanes of silk which buoy and guide the vessel's flight, which is entirely governed by an electric switch, situated at any distance, on the ground, in charge of an operator. In sympathy with the operator's movements of the switch the vessel rises, falls, stops, turns, describes circles, cycloids, spirals and figures 8 in endless succession like the flight of a humming bird or "devil's darning needle." Prof. Myers says that "if people don't believe in aerial navigation after seeing this they are hard to please." The chief objection, that it does not fly out doors, and carry a passenger, is answered by the common fact that his skycycle has flown over 15 states and

39 counties of New York state, propelled and guided in similar evolutions by the muscles of its rider. The two airships somewhat resemble each other in shape but not in size, the skycycle being much larger than the torpedo and working its screw in front, though able to go swiftly backwards, while the torpedo travels only forward, like a bird. The functions of the two vessels are entirely different, the skycycle being a pleasure craft for passengers, while the torpedo is a deadly missile, for destroying an enemy. A combination of the two vessels' advantages has been effected, but has not been publicly exhibited. With such a vessel it is claimed that a speed of 20 miles per hour is practicable during 40 consecutive hours aloft without renewal of supplies, and that 5 to 10 passengers may be carried at a cost of one cent per passenger per mile.



Electric Aerial Torpedo, a Dynamite Air Cruiser, Performing All Evolutions Possible to a Bird—Propelled by Aeroplanes, and Guided and Controlled by Operator Working a Distant Switch

It is expected that the balloon farm will this coming season be the scene of great activity in the construction of airships planned by different inventors for exhibition or in contest for $100,000 grand prize offered at the St. Louis World's Fair. One such, for T. C. Benbow, a Montana airship inventor will be completed by Prof. Myers in a few weeks, and others taken in turn. The chief advantages of the balloon farm works are celerity of construction, light weight impennous gas envelopes and reduced expense through machinery employed.

INVENTS A "FIRELESS" STOVE.

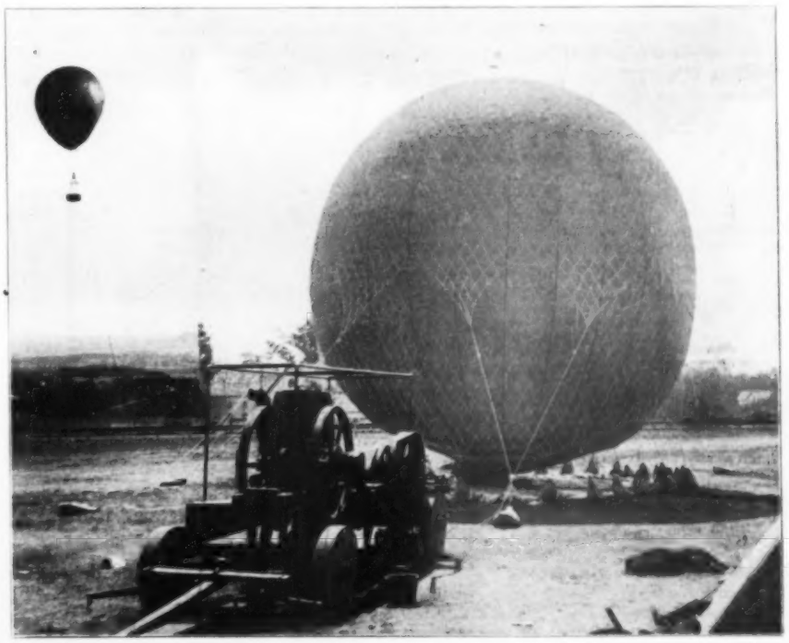
An improved smoke drum which the inventor calls a fireless stove results from the genius of one August Zacharius, a miller of Odessa, Minn. The device is said to save 60 per cent of fuel. It is a heating apparatus, the fuel of which is the smoke of any coal or wood stove. The smoke-fuel is received through a pipe at the one side of the stove. Another pipe conducts gases to the chimney of the house. At the center of the stove is a large oven below a ten-gallon water tank. Near the floor is a pan for removing soot. Dampers control the flow of smoke through the stove. The water in the big tank often rises above the boiling point, and the oven is sometimes hot enough to cook bread readily. Moreover, the apparatus is an efficient smoke consumer and emits only colorless gases through the chimney.

TO WHITEWASH WITH A SPRAYING MACHINE.

For whitewashing with a spraying machine take a 50-gallon barrel and put in it fifteen pounds of common salt and half a pound of ultramarine blue. Take a quantity of the above white wash prepartion and add sufficient water to thin the preparation to the consistency wanted for use, and stir well together. The mixture must be thoroughly stirred, so as to bring the contents from the bottom to the surface.

When this mixture is thoroughly stirred, take a clean barrel and strain this prepartion into it and it is then ready for application. If for any reason mixture is allowed to stand for any length of time, it should be strained again.

If the work is stopped for any length of time after having been commenced, clear water should be forced through the pump, hose and spray nozzles to clear and prevent the solidifying of white wash or paints used in same.



Captive War Balloon Outfit for United States Signal Service

THE MANUFACTURE OF "SPOOKS."

Popularity of Seances Has Given Rise to a New Industry

The manufacture of ghosts for spirit seances is becoming quite an industry in New York and Chicago. It used to be that every medium had to make his own outfit for a successful seance, but enterprising manufacturers have discovered the methods employed by the most ingenius of the mediums and given the benefit of their skill to the seance world. Now all any medium has to do is go into the market and order just the kind of paraphernalia he desires for his manifestations. He can buy young ghosts or old ghosts, female ghosts, with long or short, dark or light hair, male ghosts with smooth face, beards or mustache to suit the occasion. Usually every traveling medium carries a full line of the "spooks." He previously gets a description of some departed ones that are related to those attending his seance and produces a "spook," as is desired. Those present always say it is an exact likeness of dear "Aunt Peggy," or "Brother Barney," or "Sister Simpkins," as the case may be. The genius employed in the manufacture of these "spooks" might prove of greater profit if turned to more legitimate purpose than beguiling the credulous. The "spook" always consists of two or more parts, principal of which are the head and flowing robes. An entire wardrobe can be carried in the "fake watch" case of the medium, so filmy is the material of which it is made. It is far thinner than the gauziest chiffon and many yards of it can be tucked away in this hollow watch case. Another requisite of the medium is a mechanical heel on his shoe. In this he carries the heads of his spooks. The heads are thin rubber, that can be inflated like toy balloons, painted with eyes, noses, mouths and ears that look extremely realistic in the dim light the medium always says is essential to a successful seance and the medium here says the truth. Then the medium usually carries a false toe of spun brass which he fits over the toe of his shoe, to permit the sitter to press upon while he withdraws his real toe to operate his machinery. He also has several paper mache hands, which he secretes in the lower leg of his trousers that are made baggy for the purpose. John Elfreth Watkins in a recent article states:

Crazy tongs, compactly wrought of fine steel, are substituted for telescopic rods in some of these fraudulent seances. False hands, coated with phosphorous are thus manipulated, the crazy tongs being sufficiently long to project such bodies across the table or toward the ceiling. Tambourines are similarly juggled, and one supposed medium clamps at the end of his crazy tongs a compact music box, whose teeth are muffled to utter the tones of a guitar. When this is elevated to the ceiling, the effect is, of course, awe-inspiring.

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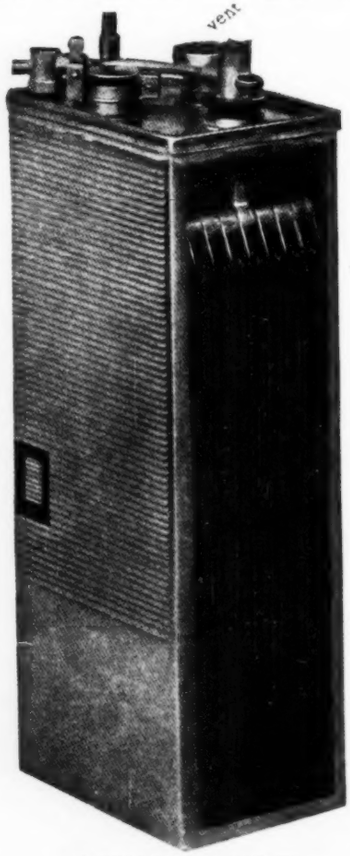
EDISON'S NEW STORAGE BATTERY.

Edison has now placed his new storage battery on the market, for which he makes many claims. It was exhibited for the first time in public at the automobile show in New York. The battery is described by the Electrical Age as follows:

The illustration shows one complete cell of the new perfected Edison battery, with the front side of the jar removed to show the arrangement of the plates. On the top of the jar is a spring stopper with a rubber flange similar to a soda water bottle stopper for filling the jar with distilled water from time to time, to replace what may be lost by evaporation; a very ingenious funnel with an automatic float valve is furnished, so that the exact amount of water may be added, leaving a considerable space between the surface of the water and the top of the jar for accumulation of gases. The jar being hermetically sealed, a vent is furnished for the escape of the gases, which consists of a nipple about three-fourths of an inch in diameter, having a gravity valve in the bottom, which valve is lifted as soon as enough gas is generated to overcome the weight of the valve.

The gases escape into a small chamber in the nipple, which is shown on the right hand top of the jar; this chamber at its top has a small partition in which are drilled two small holes about 1-64 of an inch in diameter, through which the gas must pass; it then passes through a series of very fine metal screens which are secured in the nipple or vent, thus breaking up the gases and separating the potash from the gas, which returns by gravity to the cell. It will be recalled that one of the serious drawbacks to the previous battery was the carrying over with the gases a quantity of potash used in the solution. It is claimed that 460 pounds of this battery in a Baker runabout carrying one person would, on a single charge, run 100 miles at an average speed of 10 miles an hour on a fairly level road, while a battery of 378 pounds would do the same work on an 80-mile run. The battery discharge is claimed to be far in excess of automobile requirements, and that no injury can result from heavy charging and discharging. The



Edison's New Storage Battery.

battery can be fully charged in one hour. The jar and plates are made of a special quality of steel, nickel plated to prevent rusting, this being the only reason for the nickel plating. The insulation frames are made of vulcanized rubber.

The active material in the positive plate is a combination of nickel and graphite, while that of the negative plate is oxide of iron. The electrolite is a 20 per cent solution of potash, which never escapes, and the cell has only to be refilled with distilled water.

A separator or vent separates the solution, which runs back into the cell, from the gas, which escapes. The illustration shows a 200-watt capacity cell, of a net weight of 17¼ pounds, indicating the position of the plates in the cell; on the top of the cell will be seen the connector, whose function it is to connect one pole of one cell to the pole of the other adjacent cell.

Black gunpowder, the oldest of all our explosives, was used by the Chinese in making fireworks in the seventh century. The secret of its manufacture was carried by Arab traders to Bagdad, when its adaptability for war purposes was discovered. The army of Ghen Genghis Khan first used it in cannon in China in 1234.

Accidents in London's street kill 140 persons a year and injure 5,330.

TO MAKE THE DESERTS BLOSSOM.

Government to Turn the Waters of the Colorado Loose on the Arid Lands.

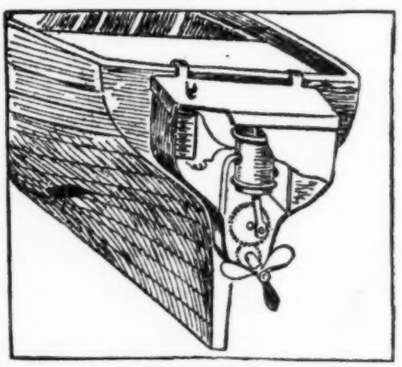
An army of surveyors is now at work mapping out the routes for the immense government canals which are to spread the water of the Colorado river over the desert lands in California and Arizona and convert them into verdant fields. The surveyors have taken sounding and run lines along both banks of the river between Bull's Head and Fort Mojave. The big diverting dam will probably be built at Bull's Head as this point affords unusual advantages and is above the head of steam navigation. Another crowd of surveyors have been working along the Colorado from Yuma.

PROPELLER FOR SMALL BOATS.

Simple Attachment that Will Save the Expense of a New Boat.

When on a long distance pull on a warm day the owner of a rowboat often wishes he had a motor launch that would not require such physical exertion. But the expense of a new boat with engine and machinery places it beyond the reach of the majority of rowboat owners. Here is shown an apparatus, the invention of Irwin R. Miller of St. Paul, Minn., which may answer the purpose fully as well as a new boat and at far less cost. It is nothing less than a gasoline motor, so arranged that it can be secured to the rear end of a small boat, with the fuel and electric batteries stored in a casing which answers as a seat for the person controlling the motor and steering the boat. The motor casing is cut away in the picture to show the method of mounting the propeller shaft and connecting the motor.

Of course this boat is not intended to compete with the high-speed and higher-priced craft which the modern boat builder is now able to produce, but it is intended for cruises or fishing trips about the rivers and lakes of the country. To place the mechanism in position on a



Novel Boat Propeller.

boat it is only necessary to store away the batteries and gasoline reservoir beneath the seat and suspend the motor casing over the stern by the hooks and clamps provided for the purpose.

The furniture of the cruiser Baltimore, now being reconstructed at the Brooklyn navy yard, is to be almost entirely of steel, thus greatly reducing the danger of fire and injury from splinters in time of action.

Cable Making a New American Industry

First Cable Manufactured in America for Foreign Owners and Description of How It Was Made

As a result of the unusual activity in cable laying manifested during the last few months the world is now linked closer together than ever before. We can now talk under water to nearly every country on the globe and events of importance are flashed through the oceans and printed in our daily newspapers almost as soon as they happen. This age of cable-laying has brought the United States into a new industry and in a recent competition an American company was awarded the contract over manufacturers of Europe, where cables have been made for generations. The contract in question was to make and lay a cable to connect the ports of Vera Cruz, Frontera and Campeche in the Gulf of Mexico. The contract length of the cable was 472 nautical miles, or 544 statute miles. The cable was made and laid by the Safety Insulated Wire and Cable Co., and is the first cable made in America for foreign owners and the first cable of any considerable length laid by an American cable manufacturing company. The specifications for the manufacture of the cable were drawn by Ira W. Henry, vice-president of the Safety Company works at Bayonne, on the water front of New York bay. The total weight of the cable was 1,500 short tons and its total coiling space 28,000 cubic feet. Usually cables are laid by regular cable ships, but as the Safety Co. did not possess such a ship it was necessary to charter a vessel and overhaul it for rthe purpose.

In the midst of so much cable emaking and cable laying round about, the American would doubtless like to know something about how the work is done, and hence we give the following description of the construction of the Mexican cable by the American company. It must be borne in mind, however, that details of size and construction differ considerably in different cables, acording to the depth of ocean, topographical conditions and the views of engineers who draw up the specifications.

The electrical conductor of the cable, says the American Electrician, consists of a strand of nine tinned copper wires—eight wires of the same size spiralled about a larger central wire. A standard conductor is not only more flexible than a solid conductor, but is also less liable to accidental breakage.

The standard conductor is given its first coating of insulation by being passed in mile lengths through a machine which lays on a thin seamless coating of pure rubber gum. The strand then passes through a second machine, in which it receives a thicker seamless coating of a vulcanized compound containing over 40 per cent of rubber. This completes the insulating portion of the covering. The outer layer of rubber compound is vulcanized by being put in a closed chamber into which steam is turned for a suitable time. This rubber covering will stand knotting, scraping and rubbing remarkably well. It is mechanically stronger in these respects than gutta-percha.

After the ruber covering is vulcanized, it is taped and the cable is joined together in 5-mile lengths, the joints in the conductor being covered, of course, by a compound that securely joins the ends of the rubber covering. The 5-mile lengths, after passing all the tests, go to the armoring machine.

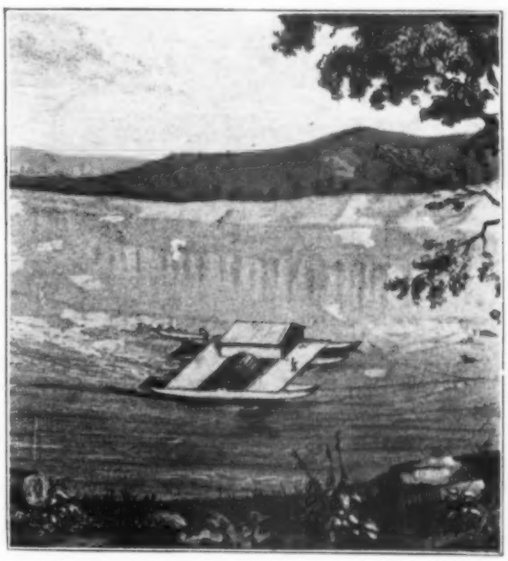
The armouring machine consists of a series of discs mounted on hollow horizontal spindles and a series of troughs, one trough being located between each pair of neighboring discs. The spindles of the discs are in line with each other, so that the cable to be armored can pass through the entire series without being subjected to abrupt bends. On each disc are mounted several bobins of the material to be applied to the cable. Thus, the first two discs in the series carry bobbins of jute; the next disc carries sixteen bobbins of galvanized steel wire, each strand of wire being covered with a compound and taped, and the next two discs carry bobbins of jute. The troughs between the discs contain a compound of a tarry character, through which the cable is drawn during the process of armoring. The first two discs revolve in opposite directions, so that as the cable passes through them it receives two layers of jute laid on in spirals of opposite pitch. Passing through the third disc, it receives the armoring of galvanized steel wires, and the last two discs apply two more coatings of jute wrapped in opposite directions. Each layer of the covereings applied to the cable is then coated with the tarry compound in the trough located next to the disc which applies the covering. After the last two servings of jute, the cable eis given a coating of preservative compound and a final coating of talcum, the function of the latter coating being to render the surface non-adhesive. Thus, the cable conductor with its covering of vulcanized rubber enters one end of the armoring machine in this condition and comes out at the other end a finished armored cable, ready to be coiled away in steel tanks, where it can be tested under water.

As each of the 16 armor wires will withstand about 1,000 pounds pull before breaking, the breaking stress of the cable is in the neighborhood of eight tons.

ODDEST OF ALL GRIST MILLS.

Early Day System of Grinding Corn by Current Power on a Raft.

Long time ago, before modern machinery supplied quite all the conveniences of life, unique methods were often resorted to by farmers in grinding their grain. One of the oddest of these methods is shown in the accompanying illustration. It is a current grist mill. The mill or raft is anchored in that part of the stream where the water flows swiftest. Underneath the two pontoons which held the structure together was a large wheel, built on the principle



Current Grist Mill.

of the conventional water wheel, which the current turned at a rapid rate. This wheel supplied power that operated the mill in the shed, which may be seen on the further side of the raft. Farmers carried their loads of grain to the mill in row boats and returned with the boats loaded with well ground meal. The American Miller, which describes numerous of these early milling systems, declares this to be one of the most ingenius ever employed.

MISSISSIPPI RIVER IN RIGHT PLACE.

Has it occurred to the average reader that the great Mississippi River system could not have been better designed for our benefit and advantage if it had been planned by our most eminent engineers? It gives us 35,000 miles of navigable water, all connected, while all Europe has only about 17,000 miles, mostly disconnected. Was it only chance that the Mississippi River ran south instead of north, or was it an act of Providence? A few feet difference in level and the river would have emptied in the Arctic Ocean and the great valley would have been almost a waste.

One of the largest canals in Egypt is the Yusef, which furnishes water for the Fayum province. It is 180 feet wide and 30 feet deep and carries 30,000 cubic feet of water per second during flood season.

Easy Electrical Experiments

By L. P. Dickinson

THE DESIGN OF A SMALL DYNAMO.—PART IV.

The armature of our dynamo is to be of the well known drum type. The armature core, the shape of which was shown in Chap. 1, is made up of a large number of toothed discs punched from thin sheet iron. These discs may be bought of the dimensions given, at various electrical supply houses. About sixty of them are needed to make a pile one inch high, so we will need 150 such discs. They are mounted upon a shaft of soft steel, which is 5-16 inch in diameter at the ends and ½ inch in diameter in the middle, and should be at least 9½ inches long. The central portion is threaded as shown in Fig. 1, and two nuts, clamping against two stiff washers, bind the whole very tightly together. The discs must be held very firmly and cannot be clamped too tightly. When threading them on cut the ends of the teeth of those discs which occupy a position ¼ inch each side of the center, so that they are 1-16 inch shorter than the teeth in remaining discs. This makes a slot which will be filled with binding wires as explained later.

Having mounted the core upon the shaft, in the position indicated by the dimension lines in Fig. 2, it must next be carefully covered with an insulating covering to keep all wires from contact with the iron. First go over every corner and sharp bend in the slots and on end nuts, covering these places with a layer of thin cotton cloth, fastened in

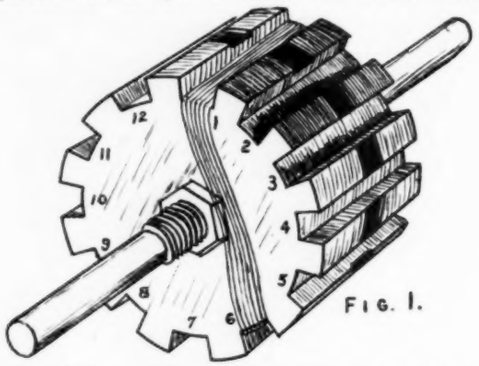


Fig. 1.

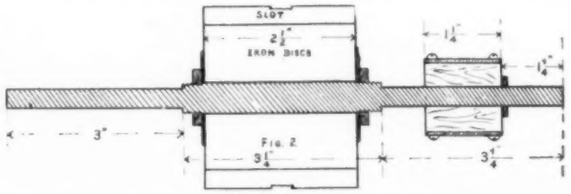
place with shellac. Then apply a layer of the cloth to the sides and bottoms of the slots, the ends of armature, and other places where the wire is especially liable to touch the iron, using shellac as a glue. Wrap two or three layers of cloth around the shaft, for a distance of two inches from the ends of core.

In winding the coils in place proceed as indicated in Fig. 1. There are twelve slots on armature, and we are to have only six coils. So each coil will occupy two slots. This is an advantage, as it lets the wires clear the shaft with little difficulty. Begin at slot number one, and wind in eight layers, carrying the wire around the armature across the end at the back, and returning through slot number six. There should be eleven turns in each layer, using number 24 double cotton covered magnet wire. This completes coil number 1, and the wire may be cut off leaving a projecting end six inches long. Its beginning should be tagged with a small tin tag marked B-1, and its end tagged 3 E-1, and the two ends twisted together temporarily.

Coil number 2 begins in slot number 3, and occupies slots 3 and 8. Its ends should be tagged B-2 and E-2, and twisted together. Coil number 3 occupies slots 5 and 10. Each coil is put on in this manner, skipping one slot between each coil. Of course they all overlap on the ends, but this can be made to present a neat appearance, if pains be taken.

When all are in place, stout brass binding wires are wound tightly in the slot left vacant at center of core, and soldered in place. These keep the copper wires from flying out when armature rotates rapidly, and are absolutely necessary. About one pound of magnet wire is required for armature. The whole armature should now be given a coat of shellac, and then placed in a warm oven to thoroughly dry.

A six section commutator is easily made by mounting a piece of brass tubing 1¼ inches in external diameter and 1¼ inches long upon a wooden hub which may be driven tightly upon the shaft. Before doing this, divide the surface of the brass tube into six sections by lines parallel to its axis. In the center of these sections and at either end, bore two holes through which pass two 3-8 inch brass screws. Then with a hack saw cut the tube into six por-



tions, sawing along the lines first drawn. The screws already inserted hold sections in place. After sawing remove each section and file off all sharp edges. If a lathe is available, the surface of commutator should be turned down smooth and circular, after sections are again in place.

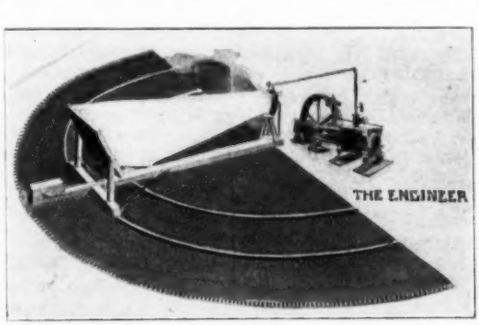
Connect the end of coil number 1 (E-1) and beginning of coil number 2 (B-2) to a section of commutator. Connect E-2 and B-3 to next section, E-3 and B-4 to the next, and so on around the armature. These connections should be made smoothly and uniformly. It is best to make connections by soldering, as this throws less strain upon the screws in commutator. A little copper ear may be clamped under each screw to which connections may be soldered.

STEAM MAKING BY SOLAR HEAT.

The accompanying illustration represents a steam boiler and engine recently erected in St. Louis, Mo., says the Engineer. Steam is generated by solar heat directed against the heating surfaces of the boiler by means of a large mirror. The mirror is swung on trunnions journaled in a substantial frame, the latter resting on a circular track, and by means of clock work is moved around the circle at a certain speed, which is just sufficient to keep the mirror or reflector at the proper angle with the sun's rays. The frame is caused to revolve by means of a circular rack outside of the circular track, as shown, the frame traveling continuously day and night, so that it is always in the proper position when the sun shines. The water supply is regulated so as to automatically maintain the desired steam pressure when the boiler is furnishing the required amount of steam to the engine.

The water is fed into the boiler by an automatic injector through a funnel shaped coil of pipe around the outer rim of the front of the boiler, and is there heated to the boiling point before entering the boiler.

The inventor claims that a reflector containing 2 square



Solar Furnace Connected with a Corliss Engine.

yards is sufficient to generate steam for a 1-horsepower engine, and that a reflector 25 feet square is sufficient for a 32-horsepower engine, and that one 44 feet square will run a 100-horsepower engine.

If a finger has been pounded or crushed, plunge it into water as hot as can be borne. This will relieve the pain quicker than anything else.

It is proposed by French aeronauts to observe active volcanoes from a captive balloon.

Freights are low in England and 109 idle vessels are tied up in the harbor of Shields alone.

PUBLIC SCHOOLS TO BURN OIL.

Worcester, Mass., Tires of Paying Exorbitant Prices for Coal.

Worcester, Mass., is about to adopt the use of oil for fuel in its public schools. It is proposed to utilize for this purpose a burner, which is the invention of Joseph Girard, 7 Bloomingdale road, Worcester. It has already been tested and proved successful. The cost of fuel amounts to about one-third the cost when coal is used.

Mr. Girard's patent is a burner, called the Volcano. It is a simple device by which the steam from the boiler is made to blow the flame the entire length of the boiler. Mr. Girard claims that with this burner he can throw the flame more than 30 feet, so that every section of the bottom of the boiler is heated separately. The oil is fed into the burner by gravity, the tank being set high enough so that the oil can run down. It is so arranged that it cannot leak and hence there is no odor. The device is also smokeless and occupies comparatively little space.

THE AMERICAN INVASION IN MEXICO.

Passing of Old Time Conditions that Amazed and Amused the American Tourist.

No where is the American invasion finding a more profitable and opportune field of operation than in old Mexico. The entrance of newly improved farm machinery into Mexican agriculture is slowly but surely doing away with old conditions that, heretofore, have always been themes of study and amusement to the tourist. In the midst of a land so fertile that the soil is ever ready to repay meager efforts with liberal returns the Mexican agriculturalist permits the vast amount of the verdant fields to remain idle while at his door he tills enough ground to let him live in his crosen condition of innocuous desuetude. A hamlet, such as is herewith shown, is his favored place of abode. The Montezuma Plantation Company, 1107 Ashland Block, Chicago, is one of the foremost of the concerns that are working the wonderful development of Mexico. Tropical Truth says:

It was not uncommon—in fact, is not uncommon even now—to see great estates lying in idle wilds with a few acres near the homestead tickled with a stick producing all that a large family and numerous dependents require for their simple habits of living. Most of the fruits consumed in the cities of Mexico today are imported from California and sold at outrageous prices.

Montezuma Hamlet and Pineapple Field.

A German physician has reduced the solid constituents of milk to powder form.

PHOTO BY NATURE'S FLASH LIGHT.

Japanese Boy Takes a Wonderful Midnight Picture.

Here is shown the most remarkable photograph ever obtained on the Pacific Coast where peals of thunder are seldom heard and flashes of lightning are rarities.

Japanese Boy's Strange Midnight Photograph.

The scene is of the Cliff House, the imposing structure whcih stands sentinel over the Golden Gate. The lightning here served the purpose of a flash light and even to far better advantage. The photographer stood with his camera open while the storm raged and during a most vivid flash of lightning at midnight this picture was obtained. He waited hours for the chance but his patience was rewarded with marvelous results.

The photographer was a Japanese boy.

HAT THAT TIPS ITSELF.

Inventor Comes to the Rescue of That Much-Abused, Over-Popular Gentleman.

"Swell" automobilists, naval and military officials of high distinction and the leisure class of nobility often find their most arduous duties to consist in tipping their hats to lay acquaintances and others. To save this very aggravating physical exertion a Frenchman has invented a hat that will tip itself.

The crown of this curious headpiece contains a sort of clock-work arrangement that operates a set of springs. This machinery is wound up before the wearer starts out on his walk or ride. When he wants to salute some one instead of carrying his hand to the brim of his hat he merely finds it necessary to incline his head slightly, that movement serving to put the springs in the crown of his hat in operation. His brow displaces a small brake, and the springs lift the hat gracefully from his head. He can keep on saluting until the machinery is run down.

The Burlington railroad is installing a long distance telephone in the telegraph offices along its lines.

SHOP NOTES

HINTS TO INVENTORS.

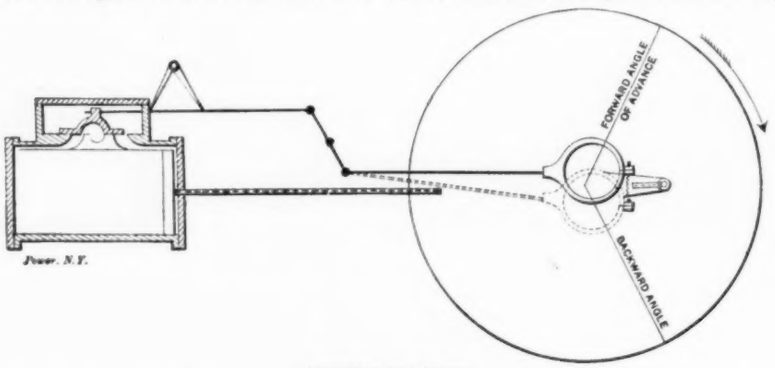
The Canadian government is experimenting with gasoline lights for buoys, but is not satisfied with the burners thus far offered

REVERSING A SHOP ENGINE.

In some mills or factories where wooden pulleys are used, it is sometimes necessary to run the engine backwards, in order to turn a pulley that cannot be got at when the machinery is running in the usual direction, says a writer in Power.

To work the engine backwards for a half an hour, or perhaps an hour with the bar is hard work and unsatisfactory. If any of your readers have a job like that to do, he can easily reverse his engine by following my instructions.

Set the engine on either dead center,



Reversing an Engine.

whichever one will bring the eccentric easiest to get at. Let us suppose we set it as in the cut. The piston is now at the crank end of the cylinder, and must take steam at that point; no matter which way the balance wheel is to turn. It is presumed that the eccentric and valve are properly set to run the engine in the direction indicated by the arrow. But you want to run it the other way.

Now take some suitable tool and mark the eccentric and shaft so you can put it back to its original place when you are ready to do so. Loosen the eccentric, then with a pair of compasses, as shown in the cut, having one leg against the steam chest or other immovable object, with the free leg make a fine but plain mark on the valve rod; hold your compasses steady on the steam chest and let an assistant turn the eccentric backwards. Your mark will now leave your compasses and move towards the crank. Keep turning and it will come back to its first position.

The valve is now in the same position that it was in the first place, but the eccentric is in the position shown by the dotted lines. Fasten your eccentric and give the engine steam and it will run backwards.

I have purposely exaggerated my eccentric and rockshaft angles, so as to make it plainer.

Meteorological instruments of gigantic size have been designed for the summit of Mont Blanc. They are to be read by telescope from Chamonix at the foot of the mountain.

ESTIMATING LENGTH OF BELTS AND SPEED OF PULLEYS.

Editor Popular Mechanics:—I find numerous good mechanics who do not seem to catch on quickly about estimating the length of belts, and the speed of pulleys. I offer two short methods which might be of interest:

Problem 1st. The speed of a line shaft is 240; the speed of the driven pulley, 650; diameter of the driven pulley, 7 inches. Required, size of pulley for line shaft. Statement in simple proportion, 240: 650:: 7 ins.=19 23-24 ins. Which is the size required.

Problem 2d. The distance between two shafts is 10 ft., the diameter of one pulley is 18 ins., the diameter of the other 31 ins. Required, the length of belt. Solution: 18+31 ins. =49 ins. ÷7=7×11= 77 ins. which is the distance half way around each pulley. This added to twice the distance between shafts, or 20 ft., gives 26 ft. 5 ins., the length required. This rule is not absolutely correct but is accurate enough for all estimating, and is based on the rule used by all sheet metal workers, viz., 22-7 of the diameter equals the circumference of a circle. The error in this being the difference between 1-7 and .1416. Different sized pulleys causing great angles would make this rule fall short. But belts cut by it will usually have to be cut again to take up the stretch.

L. H. Hand,
Glenwood, Ill.

GAS DISTILLATION.

In order to aid the distillation of coal in gas manufacturing processes and to obtain a higher percentage of heavy hydro-carbons, a known plan is to admit water gas to the retorts. A new process consists in so regulating the admission of the water gas that most of it is admitted at the commencement of the distillation—that is, during the time that the heavy hydro-carbon gases are being evolved in the greatest quantity. The amount is then diminished in proportion as the amount of heavy hydro-carbons evolved diminishes and is cut off entirely at the end of the second hour. The total volume of water, admitted should not exceed about one-third the total amount of gas evolved.

No Chinaman, however rich or poor, will wear woolen clothing.

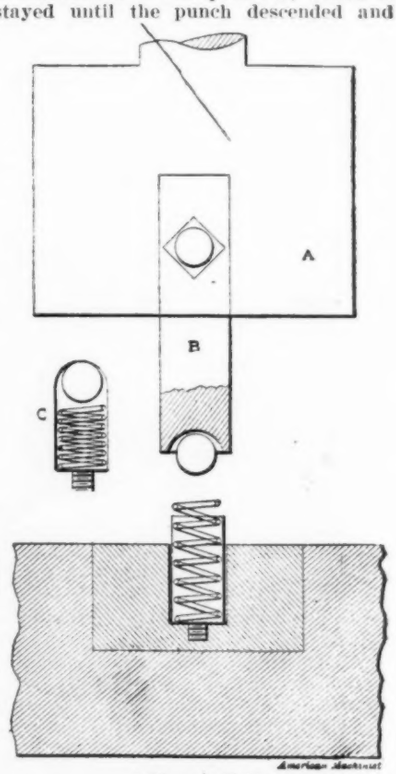
MOLD FOR CASTING BRITANNIA METAL.

Plaster of Paris molds treated to a coat of silicate of soda (water glass) and thoroughly dried makes fair molds for Britannia metal for a few castings, says the Metal Worker. The principal trouble in casting Britannia metal is from lack of proper ventilation of the mold by small channels in the cleavage of the mold near the sprue. No mold of plaster or cement composition will last for any length of time. Good brass molds are easily made by casting the plaster forms in sand, finishing the surface required and thoroughly black leading the surfaces exposed to the Brittania metal.

MAGNETIC TRICK IN THE SHOP.

Although the use of magnetic chuck is familiar to most of us, I cannot call to mind any record of its use on the press. Anyway, the following scheme proved well worth the cost of fixing up for it, says a correspondent of the American Machinist:

We have a very large quantity of oil-hole covers to make of the well-known spring-and-ball type, and some trouble was experienced in placing and keeping the ball in position while the punch descended and closed the tube around it, owing to the spring being open and extending beyond the mouth of the tube. To overcome this difficulty a magnetic coil was wound around this false nose A, and the ends of the wire were connected with the dynamo current. This enabled us to place the ball in the hollowed bottom of the punch B, where it stayed until the punch descended and



A Magnetic Trick.

forced it into its place in the tube, at the same time closing the mouth of the tube around it. A spring knockout ejected the oil-hole cover from the die.

WHY PAINT CRACKS AND PEELS.

By Stanton Dudley.

The observer who remembers what he sees will have noted that paint applied to new work seldom cracks or peels, while paint applied over old paint very frequently exhibits these faults. If you ask the painter why paint cracks he will probably answer, "Because it is cheap ready-mixed stuff." If you corner him, however, he will admit that any paint will crack under certain conditions. It is his business to see that these conditions do not exist, but he seldom takes the trouble to do so.

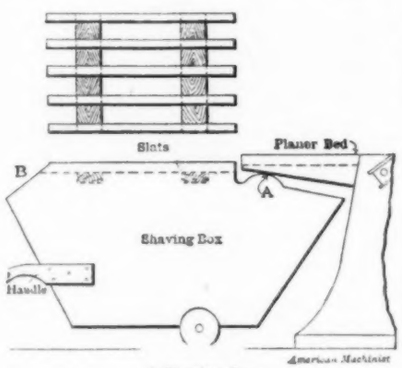
The reason that paint cracks and peels over old paint is very simple. The repainting has been too long delayed, and the old coat, having lost its oil, it brittle and very lightly attached to the wood, so that the contraction of the fresh coat pulls it away. The cure for this defect is the proverbial "ounce of prevention"—do not too long delay repainting. If the critical point has been passed, a little probing with the blade of a pocket knife will demonstrate the fact, and then scraping or burning off is the only recourse.

The rule applies to straight lead and oil as fully as to the cheapest ready-mixed paints, and there is no possible way of saving money by delaying too long the inevitable repainting. Pure oil combination paints compounded with zinc white and white lead or other ingredients will stand longer without repainting than any other materials, but it is poor economy to delay beyond the danger point the job of repainting, no matter what paint is used.

CONVENIENT SHAVING BOX.

With a cheap shaving box, as shown in the sketch, heaps of shavings around a wood planer and scattered all over the shop can be avoided, says the American Machinist.

It answers two purposes: to catch the shavings and as a table for lumber. It is mounted on wheels so placed that the handle end is the heaviest; this keeps the other end up to planer bed at A, and it is free to move up or down with the bed. The slats are made of hardwood ⅝ inch thick and 1½ inches wide, spaced to allow shavings to drop through and leaving an opening at B for shavings



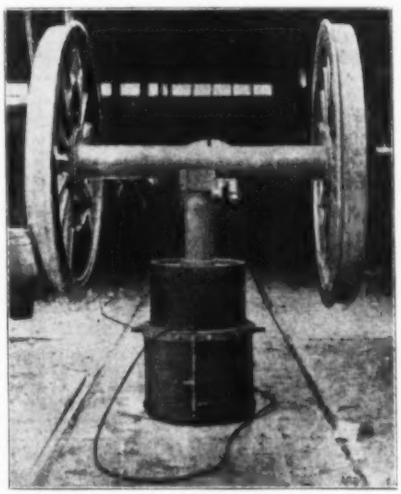
A Shaving Box.

scraped along with the lumber. When sweeping up the shop the slats can be removed and the sweepings can be put in the box and carted away.

TELESCOPING AIR JACK.

The air jack works on the same principle as the hydraulic jack, but moves quicker. The cut shows an air jack recently built by the Hicks Locomotive Works, Chicago Heights. The Iron and Machinery World says:

The jack consists practically of two cylinders, one operating within the other, and a piston traveling within the inner cylinder. The outer cylinder is a section of 24-inch wrought iron pipe and the inner cylinder is of 20-inch pipe. The cylinder heads and piston are cast iron and the piston rod is a piece of 6-inch pipe. The inner cylinder and piston are packed with leather to prevent leakage of air while in operation. The air hose connection and arrangement of piping to admit the release of air are shown in the engravings. A check valve is to be attached to the air distributing pipe between the globe valve



Telescoping Air Jack.

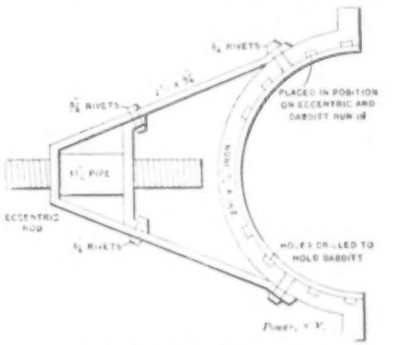
and drain cock to maintain pressure in the cylinder in case of accident to the hose after pressure has been applied. The piston travels 14 inches within the inner cylinder, the inner cylinder in turn traveling 12 inches within the outer cylinder, giving a total travel of 26 inches. Around the top of the outer cylinder is a steel band, held in position by tap bolts, supporting two journals which are designed to fit in bearings on a truck constructed to transport the jack to any desired point about the shop.

SUBSTITUTE FOR VARNISH.

A German invention of a varnish substitute consists in boiling size and kerosene for some time, and dissolving colophony in the liquid which has been separated from the residue. Six parts of size are boiled with 50 parts of kerosene until the forming scum which has to be removed from time to time, assumes a brown tint; the solution is then filtered and 25 parts of rosin are dissolved in it. Colors incorporated with this mixture give a homogeneous and stable varnish, yielding a glossy and lasting coating, when applied to wood, iron, walls, glass, etc.

REPAIRING AN ECCENTRIC STRAP.

The cut shows the method or repairing a broken eccentric strap until a new one could be procured, which in this case was



Repair of an Eccentric Strap.

several days, says Power. The cut fully explains itself. The repair did good service for ten days and doubtless would have lasted indefinitely.

COLORED DESIGNS ON MARBLE, ETC

A new process of producing colored designs on marble, stone, cement, etc., preserves sharp contour lines while admitting of a deep penetration of the color into the treated material. The contour lines are drawn on the surface with a pen or a fine brush, moistened with water-glass solution, or a similar pore-closing fluid, colored black for the sake of distinctiveness. The lines are painted several times over, so as to penetrate deeply into the stone which is preferably treated to facilitate the penetration. Colored fluid which will not mix, such as water, ammonia water, glycerine or spirits of wine on the one hand and oil, turpentine, petroleum, ether, wax, rosin, sulphur, etc., on the other are applied simultaneously on the two sides of the contour lines. The fluids limit each other's expansion below the line, which thus retains its sharpness within the body of the marble. If the pattern is applied on both sides of a thin slab it will extend right through it. One of the fluids may contain a pigment and the other be uncolored. If the latter is petroleum, benzine, ether, etc., it can be eliminated by heating the marble or by means of a suitable solvent, and the uncolored part may then be colored separately. When the color is dissolved in wax and applied to hot marble the penetration can be hastened and increased by means of a hot stamp or templet.

BUILT-UP CONE PULLEY.

A firm in Nuremberg is introducing built-up cone pulleys of peculiar construction. The pulley consists of a number of steps of stamped sheet metal each step forming a cylinder inwardly flanged at one end, and connected axially by a tube. The external flange of each cylinder is but little larger in diameter than that of the next smaller step. Of course any number of steps, according to requirements, may be used. Several methods of securing the central tube in position are proposed.

New England now makes but 6 per cent of the boots and shoes manufactured in this country.

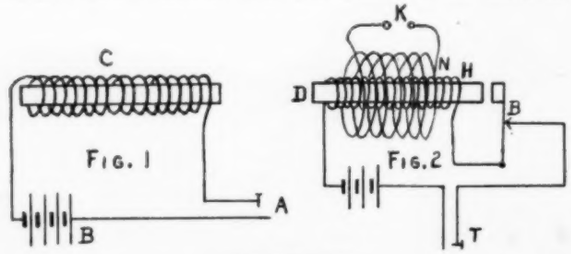
SPARK COILS AND GAS ENGINES.

Gas and gasoline engines depend for their action upon the explosion in the cylinder, of a mixture composed of inflammable gas and air. This mixture is almost universally ignited by means of an electric spark. This spark may be secured in two ways, which will now be explained.

If a circuit be made up composed of a coil C (Fig. 1) wound upon an iron core, a battery B, and a contact point A, hardly any spark is produced when the current is closed at A. This is because the coil possesses high self-induction and absorbs all the energy of the current at the instant of closing the circuit.

When the circuit is broken at A, however, a heavy spark is produced, which may be large enough to ignite an inflammable gas, if the spark be in contact with the gas. Many gas engines work upon this principle. They employ a cam driven upon a shaft connected with the fly wheel, the cam working a lever so as to close and then open an electric circuit made up as described above. The same principle is also employed in certain forms of apparatus which may be applied to ordinary gas jets.

An electric spark may be produced in another way. We may use an induction coil which consists of an iron core D (Fig. 2), a coil of wire H surrounding this core. Outside of these, and securely insulated, is a second coil N of very fine wire. When the electric circuit is closed at T, the hammer B flies rapidly back and forth, breaking the circuit at B many times a second. The fluctuations in the magnetism



Spark Jump Coil.

of the core thus produced, give rise to an electro motive force in each turn of the coil of fine wire on the outside. Since this consists of a large number of turns, the electromotive force of all the turns added together is sufficient to cause a spark to jump across the terminals of the coil at K. This spark may generate heat enough to ignite a mixture of gas and air. This apparatus is often called a "Jump Spark Coil." Its advantage lies in the fact that the necessary mechanism is very simple. All we need is an arrangement attached to engine for opening and closing the circuit at T at the proper instant.

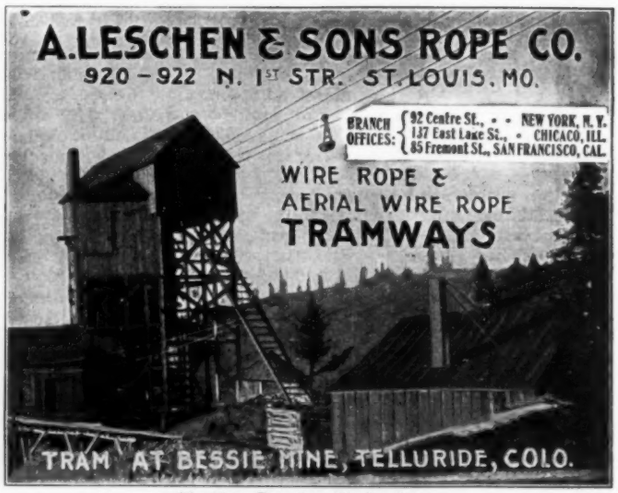
Of course the buzzer B must be very reliable, as if it sticks or fails to act promptly, the apparatus is useless.

LIGHTNING WORK IN TESTING EGGS.

A million eggs a day are received at the New York port. All these eggs have to be tested. The old method has been to pick up the eggs one by one and hold them singly against the light. The new egg tester and grading machine does away with all this labor. The eggs are simply unloaded from a big case into the machine. They are passed along in front of the operator who sits opposite a reflector. The only light that reaches this reflector must go through the eggs, 20 of which can be seen at one time. In this way each speck and spot in them is plainly seen. The eggs are then passed on by an automatic big tray. By this one little machine 72,000 eggs have been tested in 4½ hours. By the old method it would have taken a week or more to do the same work.

OIL BURNING STEAMERS BEFOUL HARBORS.

Oil burning steamers at San Francisco and other Pacific ports are being called nuisances by the public, in consequence of the large amount of refuse oil that finds its way to the waters of the harbors and the stench into the nostrils of the people who reside near them, says the Marine Journal. Not only this; the nasty, evil-smelling stuff gathers on the sides of boats, anchors, chains, ropes, anything that may be hanging overboard, as it drifts along with the tide over the surface of the water. When this condition becomes an unbearable nuisance, there will be a way found to abate it.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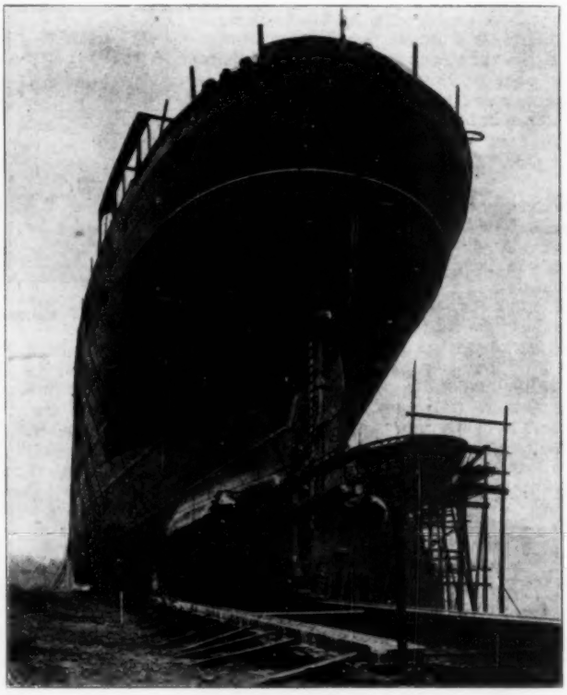
GREAT BRITISH STEAMER LAUNCHED.

The steel twin-screw steamer, Yamuna, which was launched recently, is the biggest ship in the British India Steam Navigation Company's fleet and the biggest vessel yet built on the Wear. She is 528 feet long, extreme, with an extreme breadth of 59 feet, 3 inches. Her depth from shelter-deck to keel is 41 feet, 8 inches. There are four complete steel decks, exclusive of those on the various erections or seven decks in all.



Twin Screw Steamer "Yamuna" on the Stocks—Stern View.

The propelling machinery was supplied by the Wallsend Shipway and Engineering Company, Ltd., of Wallsend-on-Tyne and consists of two sets of triple expansion engines, having cylinders 24 inches, 40 inches and 70 inches width, stroke of 48 inches. Steam is supplied by six single-ended boilers, having a heating surface of nearly 15,000 superficial feet, to work at a pressure of 200 pounds.

"So he gave you a dog?"

"Yassir," answered Erastus Pinkley.

"He must like you."

"Well, I can't make out foh sho' whether he likes me or whether he don't like de dog."

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Nothing has worked so important a change in the life of the American farmer as the establishment of the rural free delivery service. It has brought the farmer from darkness into light; placed him in daily touch with the great world without and added three-fold to his comforts. But a short time ago he had to go to town for his mail and his supplies, and in doing so often had to travel miles and lose much valuable time. Often he could not afford to go but once or twice a week. Now his mail is brought to his house each day. He can order by mail what he desires. He need never leave his home and know more about what is going on in the world than he ever did before.

A Rural Carrier on His Route.

In the accompanying illustration is shown a rural free delivery carrier and his wagon making one of the accustomed stops at a farm house. The wagon is known as the Postman and is well equipped for the carrier. Built strong enough to stand the hardest jolting; tight and compact, the carrier in here is snugly housed against the elements and feels quite at home while making his journey from one house to the other. The wagon is a veritable postoffice on wheels. It is fitted with pigeon holes for assorting the mail while en route, writing desk, and cash drawer. The number of the route is painted on the side. It has sliding doors, glass windows and the body rests on springs of superior mechanism which protects the carrier from the jolting when traveling along the rough country roads.

The Western Union Telegraph Co. has 1,029,984 miles of wire.

LARGEST DIPPER IN THE WORLD.

It is On the Great Dredge Now Deepening the Chicago Harbor.

The largest dipper in the world is in Chicago. It is seven feet wide and ten feet high and holds eight cubic yards, water measure. The dipper is the principal mechanism of the gigantic dredge No. 3 being operated by the Lydon & Drews Company in deepening the Chicago and Calumet harbors. This is the largest, strongest and best equipped dredge now afloat on fresh water. It was built by the Featherstone Foundry & Machine Company of Chicago at a cost of $85,000. It digs 4,000 cubic yards per day, equal to a train of dirt wagons ten miles long. While the dipper is by no means the largest part of the dredge, yet as all the other parts are built for the sole purpose of operating and making the dipper effective, it at once attracts the eye and becomes the center of interest, for by the work and capacity of the dipper only is the value of the dredge determined.

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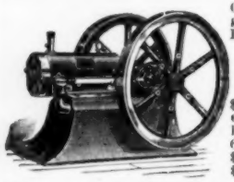

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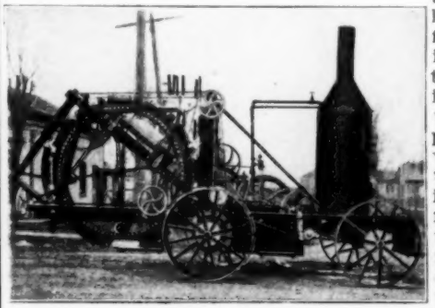
DIGS DITCHES AS IT MOVES.

Traction Machine that Does the Work of From 15 to 100 Men.

No longer is it necessary to tug with pick and spade in cutting trenches for field and road drainage, pipe line and water works jobs. A machine that can do the work of from 15 to 100 men, neater and better, has now come into the market and the erstwhile "man with the spade" has little more to do than look on and watch it dig. The amount of work the device can do depends on its size. It is called the Buckeye Traction Ditcher and is really a marvel in its construction and operation. It digs a ditch as it moves along without ever stopping and all with once passing over the ground. Van



Buckeye Traction Ditcher.

Buren, Heck & Marvin Co., 118-132 Fair street, Findlay, O., are its manufacturers. It is made in four sizes, at present, cutting from 11½ inches to 24 inches in width and from 4½ to 6½ feet in depth. The machine shown in the accompanying illustration is of the 11½ inch size. Like the larger ones, it is easily manipulated and wonderfully substantial in construction.

PICK CHICKENS BY ELECTRICITY.

It takes a good plucker all his time to pluck one dozen chickens in an hour. In a big factory where 500 dozen chickens are daily put in tins, the plucking is done by hanging the fowls on a receptacle surrounded by electric fans working 5,000 revolutions a minute. The saving in wages amounts to about $5,000 a year.

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His favorite feed—his special need—
Is Eata Heapa Oats.

But sister Lil can't see how Will
Can touch such tasteless food;
As breakfast fare it won't compare,
She says, with Shredded Wood.

Now, none of these Leander please;
He feeds upon Bath Mitts,
While Sister Jane improves her brain
With Cero-Grapo-Grits.

Lycurgus votes for Father's Oats,
Proggine appeals to May;
The Junior John subsists upon
Uneeda Bayla Hay.

Corrected Wheat for little Pete,
Flaked Pine for Dot; while "Bub,"
The infant Spratt, is waxing fat
On Battle Creek Near-Grub.
—Chicago Tribune.

DEVICE TO PREVENT CARS FROM TELESCOPING.

When a railway collision occurs the tendency is for the cars to continue their movement in a straight line, with the result that they either mount one upon the other or are telescoped with loss of life among the passengers being sure to follow. The particular object of a new invention is so to improve the construction of railway cars that when they come into violent contact they will glance one upon the other, and be laterally displaced so that while their derailment will still take place, they will not be telescoped or crushed together. It is the intention of the inventor to place the frames both at the floor level and above the door line, in order that they need not interfere with the entrance or exit of the passengers. When two cars fitted with these frames are connected the pointed ends of the steel construction will come on opposite sides of the longitudinal center, causing the car to glance in opposite directions when a collision takes place.

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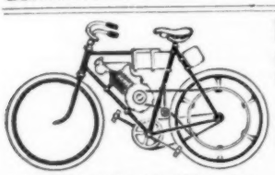

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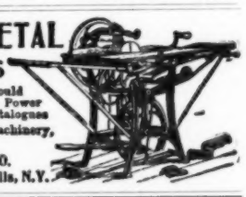

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Simple Device for Converting Alternating Into Direct Current

Electricians are greatly interested in the reports of the first public exhibition by George Westinghouse, in London, of the new method of converting alternating into direct current. The Street Railway Journal says:

Briefly, the system, which has been developed by Peter Cooper Hewitt, of New York, is one for the conversion of alternating into direct current, the central feature of which consists in the utilization of peculiar properties of electrodes sealed in a receptacle containing vapor at a certain degree of attenuation. Under this condition the electrodes act as electric valves, permitting passage to one portion of the alternating wave and suppressing another portion. The remarkable feature of the system is the extreme simplicity of the apparatus. A converter for 200 lamps, for example, is little larger than a 100-cp incandescent lamp, is even more simple in construction than the latter and weighs but a few pounds. Merely as an interesting comparison, it may be observed that a rotary converter of the same capacity would weigh in the neighborhood of 700 lbs. Although developed for use in connection with mercury-vapor lamps, the system is also equally applicable to conversion for power circuits.

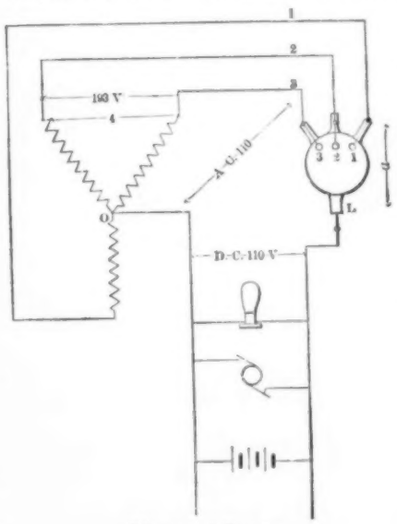
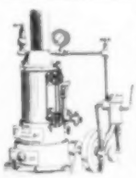


Diagram of Circuits.

The diagram illustrates the circuits; 1, 2 and 3 are the circuits of a Y-wound, three-phase generator, the leads of which connect to the static converter electrodes, 1, 2 and 3. One side of the working circuit is connected to the lower or mercury electrode of the converter and the other side to the neutral point of the Y-winding. The working circuit is shown to contain an incandescent lamp, a direct-current motor and a storage battery. The fourth electrode on the top is only used in starting up, when it is connected for a very short period to a circuit including a "choke" or "kicking" coil. When used with a Cooper-Hewitt mercury-vapor tube a higher voltage than the normal running voltage is usually required; this voltage is supplied from the auxiliary circuit during the very short period necessary to produce the proper condition in the tube to start up the discharge from the normal circuit. Very shortly after the converter is in circuit it attains a normal temperature at which it will operate indefinitely. The amount of heat to be dissipated at the converter is a direct function of the drop of about 14 volts, and the dimensions of a converter can be quite accurately fixed to dissipate the heat incident to a given maximum load.

A striking peculiarity of the system is the fact that the drop in voltage between the upper electrodes and the mercury electrode is constant at approximately 14 volts at all loads on the converter. That is to say, this drop remains the same whether the current passing is ½ amp. or 90 amps. At present this drop is about 14 volts, but late experiments have indicated a possibility of reducing this considerably, even to as low as 6 volts. Assuming the former figure, the efficiency of the present apparatus can be simply determined. The converter, illustrated the diagram has been operated at a voltage as high as 1,800, in which case the efficiency passes 99 per cent, while at 600 volts it would be about 95 per cent. It follows from the above that the voltage delivered to the working circuit is constant whatever the load on that circuit, and measurements have shown this to be actually the case. Experiments indicate that the converter in its present form is capable of handling commercially voltages up to 3,000, and that with further improvements the range may be extended to 10,000 volts.

The Western Union Telegraph Company has made a contract with the Kansas City, Mexico & Orient Railroad to conduct its telegraph business for 25 years.



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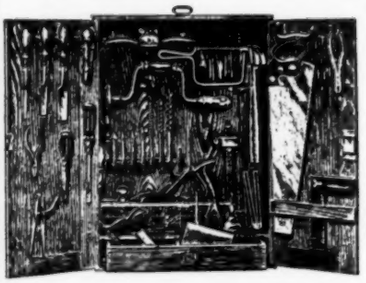

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